
**Mining and earth-moving
machinery — Rock drill rigs and rock
reinforcement rigs —**

**Part 2:
Safety requirements**

iTeh STANDARD PREVIEW
*Engins d'exploitation minière et de terrassement — Appareils de
forage et de renfort de roches —
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Partie 2: Exigences de sécurité*

[ISO 18758-2:2018](https://standards.iteh.ai/catalog/standards/sist/13c11708-31fb-4bd9-b968-7f47e9aa7a24/iso-18758-2-2018)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 82, *Mining*, in cooperation with Technical Committee ISO/TC 127, *Earth-moving machinery*.

A list of all parts in the ISO 18758 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is a type C standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers;
- mining companies;
- health and safety bodies (regulators, accident prevention organisations, market surveillance, etc.).

Others that can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups are:

- machine operators;
- service providers, e.g. for maintenance;
- third party system and technology providers.

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the scope of this document.

When requirements of this type C standard are different from those which are stated in type A or B standards, the requirements of this type C standard take precedence over the requirements of the other standards, for rock drill rigs and rock reinforcement rigs that have been designed and built according to the requirements of this type C standard.

The following assumptions were made in writing this document:

- a) the operators of the machines are well trained professionals and aware of potential risks of the working environment (see ISO/IEC GUIDE 51:2014, 6.1 a);
- b) the machines are operated according to the instructions given by the manufacturer, such as operator's instructions (see ISO/IEC GUIDE 51:2014, 7.4.2.2);
- c) administrative controls are in place for preventing unauthorized entry of persons to the area where machines are working (see ISO/IEC GUIDE 51:2014, 6.2.2 and note).

For increased readability of this document, rock drill rigs and rock reinforcement rigs are called rigs.

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Mining and earth-moving machinery — Rock drill rigs and rock reinforcement rigs —

Part 2: Safety requirements

1 Scope

This document specifies the safety requirements for rock drill rigs and rock reinforcement rigs designed for the following underground or surface operations:

- a) blast hole drilling;
- b) rock reinforcement;
- c) drilling for secondary breaking;
- d) dimensional stone drilling;
- e) mineral prospecting, e.g. utilizing core drilling or reverse circulation;
- f) water and methane drainage drilling;
- g) raise boring.

NOTE Rigs can be designed for more than one of the operations above. See ISO 18758-1 for vocabulary.

This document is also applicable to earth-moving machinery as defined in ISO 6165, modified to become a rock drill rig or rock reinforcement rig.

This document is not applicable to the following machines: drill rigs for soil and rock mixture; (geothermal drill rigs, water well drill rigs, water jet drill rigs, micro pile drill rigs; surface horizontal directional drill rigs (HDD) as defined in ISO 21467), kelly drill rigs (and casing drivers); cable tool drill rigs; pre-armouring machines; sonic drill rigs; shaft sinking drill rigs; crane attached drill rigs; drill rigs on derricks; scaling machines.

This document deals with the significant hazards, hazardous situations or hazardous events, as listed in [Annex E](#), relevant to rock drill rigs and rock reinforcement rigs (see ISO 18758-1), when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer.

This document is not applicable to rigs manufactured before the date of its publication.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2631-1, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*

ISO 2867, *Earth-moving machinery — Access systems*

ISO 3449, *Earth-moving machinery — Falling-object protective structures — Laboratory tests and performance requirements*

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ISO 3450:2011, *Earth-moving machinery — Wheeled or high-speed rubber-tracked machines — Performance requirements and test procedures for brake systems*

ISO 3457:2003, *Earth-moving machinery — Guards — Definitions and requirements*

ISO 3795, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 3864-2, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 4302:2016, *Cranes — Wind load assessment*

ISO 4309, *Cranes — Wire ropes — Care and maintenance, inspection and discard*

ISO 4413, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4414, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

ISO 4871, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 5006:2017, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

ISO 5010, *Earth-moving machinery — Rubber-tyred machines — Steering requirements*

ISO 6405-1, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 6405-2, *Earth-moving machinery — Symbols for operator controls and other displays — Part 2: Symbols for specific machines, equipment and accessories*

ISO 6682, *Earth-moving machinery — Zones of comfort and reach for controls*

ISO 6683, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests*

ISO 6750:2005, *Earth-moving machinery — Operator's manual — Content and format*

ISO 7731, *Ergonomics — Danger signals for public and work areas — Auditory danger signals*

ISO 9244, *Earth-moving machinery — Machine safety labels — General principles*

ISO 9533, *Earth-moving machinery — Machine-mounted audible travel alarms and forward horns — Test methods and performance criteria*

ISO 10262, *Earth-moving machinery — Hydraulic excavators — Laboratory tests and performance requirements for operator protective guards*

ISO 10263-1, *Earth-moving machinery — Operator enclosure environment — Part 1: Terms and definitions*

ISO 10263-2, *Earth-moving machinery — Operator enclosure environment — Part 2: Air filter element test method*

ISO 10263-3, *Earth-moving machinery — Operator enclosure environment — Part 3: Pressurization test method*

ISO 10263-4, *Earth-moving machinery — Operator enclosure environment — Part 4: Heating, ventilating and air conditioning (HVAC) test method and performance*

ISO 10263-5, *Earth-moving machinery — Operator enclosure environment — Part 5: Windscreen defrosting system test method*

- ISO 10263-6, *Earth-moving machinery — Operator enclosure environment — Part 6: Determination of effect of solar heating*
- ISO 10264, *Earth-moving machinery — Key-locked starting systems*
- ISO 10265, *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems*
- ISO 10532, *Earth-moving machinery — Machine-mounted retrieval device — Performance requirements*
- ISO 10570, *Earth-moving machinery — Articulated frame lock — Performance requirements*
- ISO 10968, *Earth-moving machinery — Operator's controls*
- ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections*
- ISO 11203, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level*
- ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*
- ISO 12508, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*
- ISO 13333:1994, *Earth-moving machinery — Dumper body support and operator's cab tilt support devices*
- ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*
- ISO/TS 13732-2, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 2: Human contact with surfaces at moderate temperature*
- ISO 13732-3, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 3: Cold surfaces*
- ISO 13766, *Earth-moving machinery — Electromagnetic compatibility*
- ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*
- ISO 13850, *Safety of machinery — Emergency stop function — Principles for design*
- ISO 13851, *Safety of machinery — Two-hand control devices — Functional aspects and design principles*
- ISO 13856-1, *Safety of machinery — Pressure-sensitive protective devices — Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors*
- ISO 13856-2, *Safety of machinery — Pressure-sensitive protective devices — Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars*
- ISO 13856-3, *Safety of machinery — Pressure-sensitive protective devices — Part 3: General principles for design and testing of pressure-sensitive bumpers, plates, wires and similar devices*
- ISO 14118, *Safety of machinery — Prevention of unexpected start-up*
- ISO 14567, *Personal protective equipment for protection against falls from a height — Single-point anchor devices*
- ISO 14990-1, *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 1: General requirements*
- ISO 14990-2, *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 2: Particular requirements for externally-powered machines*

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ISO 14990-3, *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 3: Particular requirements for self-powered machines*

ISO 15817, *Earth-moving machinery — Safety requirements for remote operator control systems*

ISO 15818, *Earth-moving machinery — Lifting and tying-down attachment points — Performance requirements*

ISO 16001, *Earth-moving machinery — Hazard detection systems and visual aids — Performance requirements and tests*

ISO 16368, *Mobile elevating work platforms — Design, calculations, safety requirements and test methods*

ISO 16528-1, *Boilers and pressure vessels — Part 1: Performance requirements*

ISO 16528-2, *Boilers and pressure vessels — Part 2: Procedures for fulfilling the requirements of ISO 16528-1*

ISO 20381, *Mobile elevating work platforms — Symbols for operator controls and other displays*

IEC 60073, *Basic and Safety Principles for Man-Machine Interface, Marking and Identification — Coding Principles for Indication Devices and Actuators*

IEC 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments*

IEC 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals*

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IEC 61310-2, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking*

IEC 61310-3, *Safety of machinery — Indication, marking and actuation — Part 3: Requirements for the location and operation of actuators*

EN 14492-1, *Cranes — Power driven winches and hoists — Part 1: Power driven winches*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 4309, ISO 6682, ISO 6750, ISO 10968, ISO 12100 and ISO 18758-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Safety requirements

4.1 General requirements

4.1.1 General

Machinery shall comply with the safety requirements of this document. In addition, the machine shall be designed according to the principles of ISO 12100 for hazards which are not dealt with by this document.

4.1.2 Ergonomics

The rig shall be designed according to ergonomic principles to minimise fatigue and stress on the operator. Consideration shall be given to the fact that operators can wear heavy gloves, footwear and other personal protective equipment.

4.1.3 Hot and cold surfaces and sharp edges

Where there is a risk of human contact with hot or cold surfaces, such surfaces shall be protected by guards or covers in accordance with Clause 8 of ISO 3457:2003 after being evaluated using ISO 13732-1, ISO/TS 13732-2 and ISO 13732-3. Surfaces and edges shall meet the requirements of ISO 12508.

4.1.4 Hoses, pipes and fittings under pressure

- a) Pipes, hoses and fittings shall be able to withstand the stresses from the pressure. The hoses shall be marked with the rated working pressure. The requirements of ISO 4413 and ISO 4414 shall be met.
- b) Where there is a risk that a rupture of a hose or pipe at the operator's position could cause hazard to the operator, the hoses and pipes in this area shall be provided with protective guards in accordance with ISO 3457:2003, Clause 9, or, in the case of compressible substance, with a means of restraining the hose from whipping.
- c) Hoses meant to have an open end (e.g. air, grout and mud) shall have means to be restrained against freeing themselves when they are not in use.

4.1.5 Handling of the rig and its parts

- a) There shall be defined lifting points or devices for lifting the whole rig or parts of it. The lifting points may also be used for holding and securing the machine during transport. Lifting points on the machine shall be in accordance with ISO 15818.
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- b) Components and parts of a rig which require to be manually handled shall be designed in such a way as to allow safe manual handling. If the weight or forms of components prevent safe manual handling, they shall be so designed that lifting accessories can be safely used.
- c) On articulated carriers there shall be a mechanical locking device for locking the articulation joint during maintenance, lifting and transport. The articulation frame lock shall comply with ISO 10570.
- d) Retrieving points (hooks, ears, etc.) shall be provided on the machine. They shall comply with ISO 10532.

4.1.6 Access to operating positions and servicing points

- a) Access systems shall be provided to the operator's station and to routine maintenance points. Access systems shall comply with ISO 2867.
- b) Minimum access dimensions shall comply with ISO 2860.
- c) When doors, windows and flaps are designed to open and close freely, and can be blown or unintentionally fall closed creating a hazard, it shall be possible to secure them in both closed and open positions. For surface applications, wind force while drilling, as presented in [Annex B](#), should be considered.
- d) The maintainability guidelines of ISO 12510 should be used.
- e) If provided, anchor devices for personal fall protection equipment shall comply with ISO 14567.

4.1.7 Isolation of external electrical energy sources

- a) Rigs supplied with external electrical energy shall be fitted with means to isolate them from all energy sources. Such devices shall be clearly identified and it shall be possible to lock them if reconnection could endanger exposed persons. The requirements of ISO 14118 and IEC 60204-1 shall be met.
- b) After the energy is shut off, it shall be possible to dissipate any energy remaining or stored in the circuits of the rig without risk to exposed persons.
- c) As an exception from the above requirements, certain circuits may remain connected to their energy sources, e.g. to hold parts in position, to protect information, to provide interior lighting. These circuits shall be clearly identified in the instruction handbook. They shall have permanent warning labels.

4.1.8 Prevention of unexpected start-up

Rigs shall comply with ISO 14118.

4.2 Driving, tramming and operating position

4.2.1 General

The driving, tramming and operator positions shall be designed so that all manoeuvres necessary for moving and operating the rig can be performed by the operator minimising risk to himself or to other persons.

To protect the operator from noise, dust and environmental conditions, an enclosed operator cab should be provided on machines with an on-board operator station.

There are types of rigs or operating conditions where it is not appropriate or possible to provide an operator cab. Examples of such situations include:

- a) a small size of the machine, e.g. for restricted access applications;
- b) the size or layout of the machine prevents an operator cab from being mounted on the machine in a position from which the operator can view the operations;
- c) the controls for driving, tramming and travelling may be located in a different position than the drilling controls.

4.2.2 Operator's position

4.2.2.1 Operator cab (operator enclosure)

If the machine is fitted with an operator cab, the following applies:

- a) there shall be an operator protective structure in accordance with [4.2.4.1](#);
- b) required space, leg room, etc. should be in accordance with ISO 3411 and ISO 6682;
- c) if there is a seated operator's position, seatbelts shall be provided that shall be in accordance with ISO 6683;
- d) a seat, unless the operator has to work in a standing position, shall provide the operator with a comfortable and stable working position and shall be easily adaptable to operators of different weight and height. ISO 11112 should be used for guidance. The seat shall be designed to reduce vibrations transmitted to the operator to the lowest level that can be reasonably achieved, in accordance with [4.17.3](#);

- e) for determining the seat index point, ISO 5353 should be used for guidance;
- f) the material of the interior of the operator cab shall be in accordance with the requirements of [4.16.1](#) and [4.16.2](#);
- g) there shall be either an emergency exit in accordance with ISO 2867, on a different side of the operator cab from that where the normal exit is situated, e.g. in the form of knock-out windows or knock-out panels, or tools shall be provided for breaking the window unless normal exit/entrance is for both sides of the machine;
- h) there shall be an isolation against vibration of the floor in accordance with [4.17.3](#);
- i) there shall be a protection against noise in accordance with [4.17.2](#);
- j) operator enclosure environment shall be designed using ISO 10263 (all parts) as applicable to the surrounding environmental conditions;
- k) windows shall be made of safety glass or other material that provides similar safety performance. The glazing may be adapted to the protection level required as per the risks existing in the use environment. See, for example, ECE R43, EN 356, EN 13123-2, EN 13124-2 and EN 15152-2;
- l) there shall be window cleaning devices for each window essential for visibility during operations;
- m) if provided, the filling point of the tank of the window washers shall be easily accessible.

4.2.2.2 Operator canopy

Provisions [4.2.2.1](#) a) to h) apply to operator canopies.

4.2.2.3 Elevating operator station

In addition to the provisions for operator cabs and operator canopies, the following applies to elevating operator stations.

- a) The lift and descent speed of the operator's station shall not exceed 0,6 m/s under normal operating conditions or 0,4 m/s in case of hydraulic line rupture. The operator's station shall not exceed $\pm 15^\circ$ on horizontal tilting.
- b) If service or maintenance work has to be done with a raised station, a mechanical support device shall be provided. The device shall meet the performance requirements of ISO 13333:1994, Clause 4.
- c) The elevating control shall be clearly marked and protected against unintentional activation.
- d) In case of failure of the source of energy, engine stop or hydraulic system failure, it shall be possible for the operator to lower the station to the lowest position (irrespective of the actual position) or to leave the station safely, e.g. by steps or stairs.
- e) Access shall be in accordance with ISO 2867.
- f) Load holding cylinders in accordance with [4.13.2](#) shall be provided to prevent the station from falling. As an alternative, a loader lowering control device in accordance with ISO 8643 may be used.

4.2.2.4 Tilting operator cab

In addition to the requirements of [4.2.2.3](#), the following applies to tilting operator cabs:

- a) if the operator cab front, when tilted, becomes a part of the falling object protective structure, it shall comply with [4.2.4.1](#);
- b) if a slewing seat is used, it should be adapted to the tilting conditions, for example by damping seat slew;